Wind Power & IP

Wind Power has experienced significant growth over the last 8 years. Although the industry was affected by the economic upheaval of 2009-10, a recent report by Global Wind Energy Council (GWEC) forecast that the global capacity of wind power will grow at an average rate of 13.7% over the next 4 years, following recovery in 2014 from a modest downturn. The report notes that national policies are the most significant factor affecting the market. For instance, towards the end of 2012, the US saw turbine installations surge as developers hurried to install wind farms before the government subsidy was cut at the end of that year.

Factors prompting consumer interest include recent technological advancements, such as longer and lighter wind turbine blades, improvements in turbine performance and increased power generation efficiency, which have brought the cost of wind-generated electricity in line with conventional power generation, in some locations. Other factors that have also prompted consumer interest include concerns about energy security and price stability, emphasis on local economic development, the trend towards climate change mitigation and environmental issues.

The IP Landscape

These technological advancements are a result of significant R&D activity in the industry which has led to a surge in patent applications relating to wind power. Over the last 20 years, over 90,000 applications have been filed worldwide. Figure 1 shows how wind generated power from worldwide installations (Source: GWEC Market Update 2012, Global Annual Installed Wind Capacity 1996-2012) has risen in line with the number of patents filed and granted since 1996.

![Figure 1: Comparison of the increase in wind power installations and applications/grants](image-url)
As can be seen in Figure 1, there has been a sharp rise in wind-generated power since 2004, with patent filings following a similar trajectory\(^1\), indicating a direct correlation between innovation and installation, most likely a result of the handful of large corporates dominating the industry. Unsurprisingly, Figure 2 confirms that the majority of patent assignees are leading wind turbine manufacturers.

The market continues to be dominated by key corporate players, as subsidy cuts and lack of funding has seen several SMEs face bankruptcy and liquidation, due to the great expense of developing such equipment.

Since 2000, at least 34 wind energy companies in the UK alone have been dissolved, as shown on the map in Figure 3, which indicates the number of liquidated companies in the UK per year.

Internationally, a similar pattern has occurred, particularly in the US and Denmark, where the withdrawal of subsidy funding has led companies into bankruptcy.

---

\(^1\) Pending applications typically do not publish until 18 months after filing, therefore some application in 2011 and most applications in 2012 have yet to be published.
Further evidence of the dominance of large corporates in this space can be seen when cross-referencing the top assignees with the Top 10 listed manufacturers internationally. It can be seen that there are 8 assignees (Figure 5, highlighted in green) that also appear in the top 10 manufacturers of 2012.

<table>
<thead>
<tr>
<th>2012 Rank</th>
<th>Wind Turbine Manufacturer</th>
<th>Country</th>
<th>Market Share*</th>
<th>Publication</th>
<th>INPADOC Family</th>
<th>Grant</th>
<th>Application</th>
<th>Other†</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GE Wind</td>
<td>US</td>
<td>15.5%</td>
<td>4,277</td>
<td>1,155</td>
<td>1,129</td>
<td>3,141</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Vestas</td>
<td>Denmark</td>
<td>14.0%</td>
<td>2,956</td>
<td>801</td>
<td>731</td>
<td>2,204</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>Siemens</td>
<td>Germany</td>
<td>9.5%</td>
<td>3,103</td>
<td>771</td>
<td>559</td>
<td>2,507</td>
<td>37</td>
</tr>
<tr>
<td>4</td>
<td>Enercon</td>
<td>Germany</td>
<td>8.2%</td>
<td>2,974</td>
<td>278</td>
<td>1,620</td>
<td>1,311</td>
<td>43</td>
</tr>
<tr>
<td>5</td>
<td>Suzlon Group</td>
<td>India</td>
<td>7.4%</td>
<td>1,013</td>
<td>246</td>
<td>340</td>
<td>656</td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td>Gamesa</td>
<td>Spain</td>
<td>6.1%</td>
<td>598</td>
<td>165</td>
<td>192</td>
<td>406</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Goldwind</td>
<td>China</td>
<td>6.0%</td>
<td>89</td>
<td>89</td>
<td>4</td>
<td>56</td>
<td>29</td>
</tr>
<tr>
<td>8</td>
<td>United Power</td>
<td>China</td>
<td>4.7%</td>
<td>298</td>
<td>289</td>
<td>0</td>
<td>151</td>
<td>147</td>
</tr>
<tr>
<td>9</td>
<td>Sinovel</td>
<td>China</td>
<td>3.2%</td>
<td>311</td>
<td>228</td>
<td>12</td>
<td>135</td>
<td>164</td>
</tr>
<tr>
<td>10</td>
<td>Ming Yang</td>
<td>China</td>
<td>2.7%</td>
<td>144</td>
<td>140</td>
<td>14</td>
<td>71</td>
<td>59</td>
</tr>
</tbody>
</table>

* Source: Navigant Research - total installed capacity in 2012: 43,134 MW
† Utility model or design patent

Figure 4: Top 10 wind turbine manufacturers in 2012 (Navigant Research)

The dominance of these corporates also provides geographic indicators as to the spread of intellectual property relating to wind power. As can be seen in Figure 5, a significant proportion of wind power patent applications are filed in China, the US and Europe, with the accumulative total of these 3 jurisdictions representing more than 50% of all filings, excluding PCT filings. Figure 3 shows that before 2005, wind-power related patent filing activity in the US, Europe and Japan was low, though Japan took the lead position. China now files the highest number of wind power related patent applications by some margin, however, it was not until after 2005 that patent filings in China started to overtake other jurisdictions, a direction that now places them significantly ahead of all other jurisdictions, as shown in Figure 6, overleaf.
It is worth noting, however, that more than 30% of applications filed in China are utility model patents, filed by Chinese applicants, and are generally considered to be of a lesser quality and value than invention patents. Although, even after excluding utility model patent applications, of which the majority are filed after 2008, patent filing activity in China is still significantly in front of the other dominant geographical regions (Figure 6, dotted line).

The top four manufacturers (GE, Vestas, Siemens and Enercon), also the top four assignees, evidently have a clear understanding of intellectual property and have invested heavily as a means of strengthening their competitive position. Surprisingly, given the dominance of China’s overall portfolio in this area, although four Chinese manufacturers rank in the 2012 Top 10, their patent portfolios appear to be much smaller than the other top players. This contrast is even more distinct when it comes to the number of granted patents – we did not identify any granted patents assigned to United Power. Although the portfolios of these Chinese companies are largely comprised of utility model patents, this is not surprising, as the Chinese market represents the primary, if not the only, market for those top Chinese manufacturers.
As shown in Figure 4, Enercon has the third largest patent portfolio (2,974) in our dataset. Interestingly however, the number of patent families they own seems to be much smaller, about a third of the size of Siemens’ portfolio, who own a similar number of patents. This is largely due to the different geographic filing strategies employed across manufacturers, as shown in Figure 7 above.

Top manufacturers, such as GE, Vestas, Siemens and Gamesa, maintain more than 50% of their patent filings in the US, Europe and China. However, patent applications in these three jurisdictions represent less than 20% of Enercon’s portfolio. In fact, Enercon’s overall geographical coverage of their portfolio is the most comprehensive among the Top 10.

Chinese manufacturers maintain relatively small portfolios and this is mostly comprised of patents filed in China alone. In particular, United Power, Goldwind and Ming Yang do not appear to own any patent rights in the US or Europe; with all of the patent publications of the latter two being held only in China, due to the Chinese market being their sole domain.

Meanwhile, more than 96% of the wind turbines that GE commissioned in 2012 were in the US market, according to Bloomberg’s New Energy Finance report\(^2\). As the top two countries with the most wind power installations, China and the US are dominated by two very different groups of wind turbine manufacturers.

### The US Market

![Figure 3: Top 10 wind turbine manufacturers in the US by wind power capacity 2012](Source: AWEA)

Figure 8 shows the total wind power capacity in 2012 against the number of patent publications of the Top 10\(^2\) wind turbine manufacturers in the US. It is quite obvious that GE is significantly ahead of its competitors in terms of both wind power capacity and capturing innovation; followed by Siemens and Vestas. Interestingly,

\(^2\) The chart shows 9 manufacturers, as Suzlon and Repower have been grouped together as Suzlon Group.
for these manufacturers, it seems that their US portfolio sizes are roughly proportional to their total capacity (Figure 8, broken line). With regard to the granted patents in the US, GE holds more than all the other Top 10 manufacturers combined, as shown in Figure 9. In fact, our data indicates that GE owns almost 15% of all US granted patents associated with wind power, showing that not only is the market dominated by large corporates with significant funds but that the market is in fact led by one company in particular.

The Chinese Market

With their industry dominance evident, it is perhaps no surprise that GE’s patent portfolio in China is much larger than the industrial average, where the market is mostly dominated by Chinese manufacturers. As shown in Figure 10, the portfolio size of many Chinese manufacturers is not in proportion to their strong market position. However, companies such as United Power and Sinovel are, in fact, among the top patent assignees in China.
It should be noted that the majority of patent publications in China are still pending, as shown in Figure 11. Taking GE as an example, only about 5% of its filings in China are granted, whereas the majority of Sinovel’s filings are utility model patents. This supports the late surge in the Chinese IP trend line, as seen in the geographical filing statistics in Figure 6; perhaps indicating the late growth of renewable energy in China and/or the sudden need to protect against product imitation on the Chinese market.

Of all the granted Chinese patents relating to wind power, only 3% are owned by the Top 10 wind turbine manufacturers in the Chinese market, who also only claim 14% of pending applications, as shown in Figure 12. (NB. It is not clear whether Chinese manufacturers obtain licenses from more dominant patent holders, such as GE.) It is possible that the disconnect, between total Chinese wind-power patent applications being so high and the portfolio size of their most dominant manufacturers being so small, is due to patent filings from universities or research institutions being more active due to significant incentive schemes in China.

The story in the US market is very different, where the Top 10 manufacturers now own 27% of the granted US patents and 24% of the pending applications relating to wind power, affirming their dominant market share.
Conclusion

The wind energy industry has matured greatly over the last 20 years and companies have subsequently become more competitive and more aware of protecting their IP. Figure 13 shows a breakdown of the dominant areas in which companies have been filing wind-power related patents, providing an indication of the technology areas in which R&D has been most concentrated.

Figure 13: Breakdown of classes of patent publications

Our report shows that leading wind turbine manufacturers, excluding Chinese suppliers, have invested heavily in intellectual property as a means of strengthening their market position. In particular, GE has vastly overtaken other competitors in terms of their portfolio size and filing strategy in this industry.

However, the industry has seen an increase in competition which has resulted in declining revenues, even for these larger organisations. As such, manufacturers are placing a new emphasis on safeguarding their IP rights and using their IP portfolio as a tool to gain an advantage in the market place. Inevitably, assertion of IP rights among competitors is on the rise.

The legal fight between Mitsubishi Heavy Industries and GE depicts an assertive IP strategy being implemented by leading manufacturers. GE’s litigation against Mitsubishi resulted in a severe decline in Mitsubishi’s wind turbine sales and market share in the US, finally seeing them withdraw from the US market altogether.

Meanwhile, Chinese manufacturers are increasingly focusing on innovation in wind energy, producing wind turbines with better performance and superior quality. In addition, the Chinese government incentive and subsidiary schemes in the wind energy sector have helped them keep costs at a competitive level; this has led to Chinese manufacturers dominating the internal market. However, none of the top Chinese manufacturers have a strong patent portfolio, either within China or internationally, to match their national market position. This lack of international IP strategy has resulted in a significantly weak IP position which will potentially hold back their businesses in the future, or at least limit their market expansion outside of China.
Wind energy is the world’s fastest-growing energy source and, in many international regions, it is likely to power businesses and homes with clean, renewable electricity for many years to come. As wind power installations become more cost effective and widely implemented, as patent portfolios continue to grow, and as the industry becomes more profitable, litigation cases are likely to increase both in number and ferocity. In such a potentially competitive industry, it is no wonder that smaller companies are failing to gain momentum, and it will be imperative that even the successful players manage their IP portfolios effectively in order to maximise their relative position. Failure to do so may prove to be the downfall of even some of the strongest candidates.

For further information on our IP landscaping services, or a more detailed analysis of the Wind Power industry, call +44 (0) 845 680 1953 or email info@clearviewip.com

---


iii ‘Battle Lines are Drawn’, World Wind, Philip Totaro (http://viewer.zmags.com/publication/89e68eeb#/89e68eeb/18, 2012, Issue 2)
